Step One: Calculate the square footage of the Impervious Surfaces.
Roof - 50 ft. x 50 ft. = 2500 sq. ft.
Driveway - 12 ft. x 20 ft. = 240 sq. ft.
Concrete Patio - 15 ft. x 12 ft. = 180 sq. ft.
Total impervious surface = 2920 sq. ft. = runoff surface area

Step Two: Calculate the square footage of the Pervious Surfaces.
Lawn Area 50 ft. x 30 ft. = 1500 sq. ft.

Step Three: Multiply the square footage obtained in Steps One and Two by the appropriate runofff coefficient from Table 1 and by the 7% of runoff.
2920 sq. ft. (impervious surfaces) x 0.07 (percent of runoff) x 0.9 (runoff value) = 183.96 sq. ft.
1500 sq. ft. (lawn area) x 0.07 (percent of drainage) x 0.25 (runoff value) = 26.25 sq. ft.

Step Four: Add both impervious and turf areas together to get total Rain Garden size.
183.96 sq. ft. + 26.25 sq. ft. = 210.21 sq. ft.

We will need to install a Rain Garden that is 210.21 sq. ft. in order to accommodate 100 percent of the runoff from the property.

Table 1: Runoff value for Rain Garden calculations

Type of Surface	Runoff Value
Roof, parking lot, concrete walks, decks, patios, and driveways.	0.9
Lawn, woodlot, turf, playing fields, and planted garden beds.	0.25

Cost of Supplies

To determine the approximate cost of the sample garden (210 sq. ft.) use the calculations and prices from Table 2. The soil amendment calculations are for the 210 sq. ft. garden, the six inches of ponding and three feet of soil amendments to replace the soil that does not have adequate infiltration. We are using bulk amendments and mulch.

Step One: Calculate the amount of compost, topsoil and sand you will need.
Find the cubic footage of your garden. Multiply the size of the Rain Garden by the three feet of soil amendments.

210 sq. ft. x 3.0 sq. ft. = 630 cu. ft.

Now determine the percentage of each item to be included. The recommended soil replacement mix is 50% sand, 25% topsoil (no clay) and 25% compost or leaf mulch.

Sand:
50% of the 630 cu. ft. is 315 cu. ft.
Topsoil:
25% of the 630 cu. ft. is 157.5 cu. ft.
Compost or Leaf Litter:
25% of the 630 cu. ft. is 157.5 cu. ft.

Now we know our needs of each medium in cubic feet, we can decide how many yards we need to purchase (1 cu. yd. = 27 cu. ft.).

Sand:

315 cu. ft. ÷ 27 cu. ft. = 12 cu. yd. of sand

Topsoil:

157.5 cu. ft. ÷ 27 cu. ft. = 6 cu. yd. of topsoil

Compost:

This item may be free if you have a compost pile or decide to use leaf litter. But we will also include the price for your consideration.

157.5 cu. ft. ÷ 27 cu. ft. = 6 cu. yd. of compost

Step Two: Calculate the amount of mulch you will need:

We will want the mulch to be at least 3 inches (0.25 ft) deep. So to find the cubic feet of mulch, multiply the square footage of your garden by the depth.

210 cu. ft. x 0.25 ft = 52.5 cu. ft. of mulch

Now we need to know how many yards of mulch

52.5 cu. ft. x (l cu. yd. / 3 cu. ft.) = 2 cu. yd. of mulch

Step Three: Calculate your excavation costs.

If you choose to amend your soils and decide to rent a small piece of equipment, such as a backhoe, this will be an additional charge of $160-$200 per day. You may also want to think about being able to operate this type of equipment and decide if you need to hire a professional to assist you with the installation of your garden.

Table 2: Approximate retail price for supplies

Supplies	Amount Needed	Price ($)	Total Cost ($)
Mulch	2 cu. yd.	$26/cu. yd.	$52
Sand	6 cu. yd.	$16/cu. yd.	$96
Compost	6 cu. yd.	$32/cu. yd.	$192
Topsoil	12 cu. yd.	$26/cu. yd.	$312
Native Plants	Approx. 30	$2-15/plant	$60-450
Excavator	1	$160-200/day	Cost Varies
Approximate Cost			$712-$1,102

Plant Selection

Joe Pye Weed
Virginia Department of Forestry

Jerusalem Artichoke
Virginia Department of Forestry

Great Blue Lobelia
Jennifer Anderson
USDA-Plants Database

When you are deciding what types of native plants you would prefer for your garden, consider that the Rain Garden will have various zones where different kinds of plants will thrive. For example, the center and the deepest part of the garden will support the very wet to wet-loving plants. The middle of the side slope of the garden will support the wet to dry plants, and the upper rim of the garden will support the drier types of vegetation.

Other factors that you may consider when choosing the plants for your Rain Garden are the following:

- Sunlight, moisture and soil requirements.
- Decide on your objectives, such as what type of wildlife you would like to attract, then decide on the varieties you would plant to attract those species. Refer to Appendix B for additional habitat information.
- The location of the Rain Garden will help you to decide if you prefer fruit-bearing plants. If your Rain Garden is near the driveway or walkway, you may want to choose other varieties to avoid mess and cleanup time.
- Think about where your Rain Garden is located before you plant certain trees. You would not want to plant an oak next to a powerline or too close to your home.
- If planting near a road that receives chemical treatments in the winter, choose plants that are tolerant to salt. Your local nursery can help you make those decisions.
- Think about a color scheme and visual interest for each season of the year.
- We always recommend using plants **native** to your area. Please see contact information in the back of the guide to assist you in finding plants native to your area.
- To protect your home from forest fires, refer to www.virginiafirewise.org.

Why Native Plants?

- They are best adapted for the local climate and, once established, do not need extra water or fertilizer.
- Many are deep rooted, allowing them to survive droughts.
- Native plants are attractive to the diverse native pollinators (bees, butterflies, beetles and birds).
- Natives provide habitat and food for native wildlife.
- For plant selection, refer to plant list in the Appendix D.

Building the Rain Garden

After all your planning, you are ready to mark your calendar for construction day. We have found that spring is a better time of the year, but fall may also be an option. **The next task is to make sure that you call Miss Utility at 1-800-552-7001. Please call ahead, it may take up to a week for marking.**

Step One: Site Preparation

Before excavation begins, use your plan and mark the Rain Garden areas on the ground with fluorescent spray paint. Also be sure to mark the area where you would like to locate the berm. Use the appropriate erosion controls if necessary. Silt fences or straw bale barriers can direct and contain sediment during construction. Please refer to The Virginia Department of Forestry Web site at: www.dof.virginia.gov/resources/pub-wq-bmp-fguide-03-Erosion-Control.pdf. Whether or not your are amending your soil, you may need a piece of machinery (like the one pictured) to assist with the project. You may use a roto-tiller, backhoe or bobcat depending on how deep your Rain Garden will be. If you choose to dig by hand, then you may need other volunteers who can be on site to help with installation. Either way, you will need a means to remove the extra soil (wheelbarrow, garden cart, or truck). After you have had the soil amendments delivered, the equipment placed on site, and have called Miss Utility, you are ready to dig. Please use caution when operating any equipment, and provide hard hats for those working on the ground.

Step Two: Excavation

Dig your garden the size, shape and depth that you have determined for your location. You may need to use the survey rod that you made yourself from the previous section or use other survey equipment to assist you with keeping track of how deep you have dug. Once you have excavated to the desired depth, use a hand level or survey equipment to make sure that the bottom of your garden is level throughout. If you have areas that are lower than the rest, you will have problems with too much ponding in that area.

Step Three: Amending the Soil

After the excavation is complete and the excavated soil has been removed from the location, you are ready to mix and add your amendments. You can choose to do this by hand or with the piece of machinery you are using. We have found it best to mix and add small portions of the amendment at a time. Using a wood stake and a string, mark the depth of the ponding area that you plan to leave so that you do not overfill the garden. Also, after the amended soil has been placed in the excavated area, allow it to settle overnight. After this time period, add additional soil if needed. Use the survey rod that you made yourself from the previous section or use other survey equipment to ensure that the area is level throughout.

Step Four: Constructing the Berm

In order to construct your berm, you will need to reserve soil that has been excavated from the Rain Garden. If you have clayey soil, this is one location where it is useful, or any well-packed soil will work. You will need to locate the highest part of the berm on the downhill side of your Rain Garden. The berm should not exceed 6 inches tall. Then the berm should gradually taper and lower on each side of the garden until the berm is integrated into the existing lawn.

Once you have the soil (preferably clay soil) in place, begin shaping and compacting the berm. Use your foot or tamping bar to compact because the berm will act as a dam for the runoff and will need to be firmly pressed together. As you compress the soil, smooth it into a gradually rounded berm. This will be visually pleasing and also help reduce the erosion of the berm. Seed and straw the area with your choice of grass seeds. To prevent erosion prior to the establishment of grass, you may chose to place burlap or other matting on the berm.

Step Five: Planting

Now that you have excavated the area and made any needed adjustments to the soil, you are ready to plant the plants that you have selected. This is so easy to do and can be a fun activity in which the entire family or neighborhood may participate.

If you chose not to amend your soils, you may choose to add compost or potting soils into the planting holes. Some reminders on planting:

- Dig the holes for planting shallow and broad and fill the hole gently but firmly. Do not step on the planted area to pack, this will only damage the plants' root system.
- Choose plants that are established, usually one to two years old. Ask the nursery to assist you with selecting the plants.
- If you have chosen a tree for your rain garden and the tree was dug properly at the nursery and is being planted under normal circumstances, staking should not be necessary. Please refer to the International Society for Arboriculture Web site listed in additional resources section for further information.
- Water plants immediately after installation, whether or not the soil is already moist.
- Retain identification tags from plant material until the end of the warranty period.
- Plant shrubs 3 feet apart; plant perennials and annuals 1 foot apart; plant trees 15 feet apart.

Step Six: Mulching

Mulch is applied over the soil of the Rain Garden to maintain moisture, prevent erosion, provide weed control and help improve soil conditions over time. We recommend using shredded hardwood mulch or shredded hardwood chips. The supply should be aged at least six months, or your mulch may float away. There are a few do's and do not's that we must mention.

- To provide optimum results, apply 3 inches of mulch after the plant stock has been planted in the planting soil.
- If you have chosen a tree, mulch wide not deep around the tree. Do not fall for the desire to create a "mulch volcano." The excessive mulch around the base of the tree will cause disease and damage to the tree.
- Use organic mulches, such has hardwood mulch, instead of inorganic mulches, such as recycled tires.

You may also consider porous weed block matting that could be installed in-between the soil and the mulch. This is recommended for locations that will not be weeded at least twice a year.

Maintenance

Maintaining your rain garden is not much different than maintenance already required by your landscaping. We have provided a brief outline for you to reference throughout the year.

Table 3. Maintenance Schedule

Description	Task
Plant Material	· Check plants periodically for signs of distress (wilting, yellow/brown leaves, etc.). · Clean dead debris from plants after growing season and add to your compost pile. · Weed as necessary.
Berm	· Check periodically for berm failure. · Do not allow plants other than grass to grow on berm because they could cause the berm to fail. · If water goes through rather than over the berm, this indicates failure. · Erosion ridges in berm could lead to failure.
Ponding Area	· If ponding area begins to retain water longer than specified time, then soil pores may have become clogged with particulate matter. If this occurs, you may need to replace the soil. · Check for the accumulation of sediment or debris and remove it.
Soil	· Check soil annually for excessive acidity or alkalinity. · If soil becomes compacted or if sediment clogs pores, soil layer may need to be replaced.
Mulch	· After the initial mulch layer has been applied, check periodically to ensure that rainwater has not washed out areas of mulch. · You may choose to add a new mulch layer every year, either in the fall or spring.